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STUDY OF BIJECTIVE RELATIONSHIP BETWEEN THE SINGLE AND BUNDLE COTTON FIBER MECHANICAL PROPERTIES

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The characterization of cotton fiber is very complex due to the growing and harvesting conditions of the cotton plant. It is very important for breeders to understand the relationships that may exist between specific fiber properties, overall fiber quality and yarn quality. All of these factors interact and are critical to the development of cottons that can compete in a global market. Understanding these interactions will allow breeders to more effectively use fiber data for selection purposes to improve yarn quality.

In this paper, we will focus on the relationships between fibers' mechanical properties and yarns' ones by studying their relative behavior and the relationship between single cotton fibers and cotton fiber bundles.

For this purpose, three different types of cotton fibers will be studied. These cottons were chosen from a list of twelve cottons covering a large panel of varieties and physical properties as maturity, fineness, micronaire, length, etc.... as shown in Figures 1 and 2. Classifications per length classes and linear densities will be done in order to enlarge the scale when making plant selection.

Analogical models based on springs, dashpots elements as kelvin Voigt models will be presented for each length class for single fibers and fiber bundles in order to provide additional information on their behavior. With single fiber analogical models and fiber bundle analogical models, a relationship linking these two models will be studied. This relationship should be a bijective relationship.

Properties evaluated will include elongation, single and bundle tenacities, work of rupture, etc...

Fiber bundles quality will be an effective tool in predicting yarn quality and spinning performances.

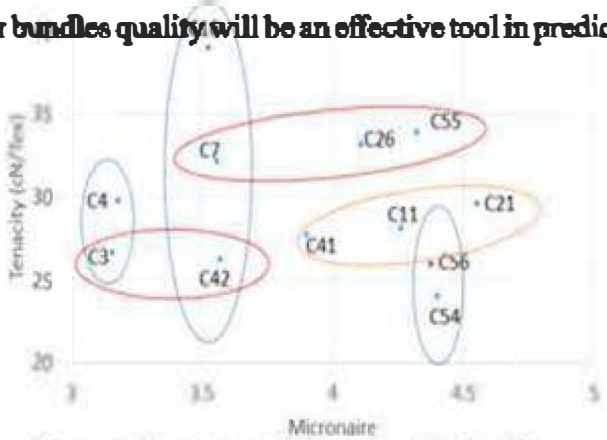

Figure.1 Tenacity vs. Micronaire for the 12 cottons

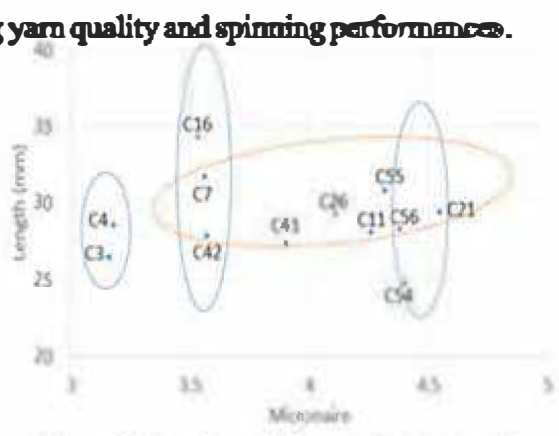

Figure.2 Length vs. Micronaire for the 12 cottons

Keywords: *Cotton, single fibre, bundles, mechanical properties, modelling, analogical models*